THE EFFECT OF LEADERSHIP STYLES ON STRESS INDICATORS IN HAWAII'S AIRPORT FIREFIGHTING PERSONNEL

EXECUTIVE LEADERSHIP

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Abstract

The problem was to determine if any connection exists between the Hawaii airport firefighting personnel's stress/health indicators and the leadership skills of their immediate supervisors. The purpose of this investigation was to determine if poor leadership skills by immediate supervisors, measured in terms of Misumi's performance (goal achievement) and maintenance (group processes and morale) indicators, contribute to adverse stress/health outcomes in their subordinates.

Research methods employed were both historical and evaluative. Published documents were searched for references to stress indicators as they relate to leadership style within fire departments. Evaluative cross-sectional research, in the form of a 47-question survey designed to measure the correlation of stress indicators to leadership styles, was also conducted.

Specifically, this paper asks:

1. How do Hawaii's airport firefighters and managers rate their immediate supervisors on a number of management dimensions?
2. How do these firefighters' and managers' perceptions of their immediate supervisors correlate with their physiological, psychological and behavioral health?
3. Do survey results indicate, as does historical research, that first-line supervisors who lack both formal management training and experience in leading precipitate higher stress levels in both the subordinates they supervise and in themselves?

Present survey results corroborated the findings of prior research. Leadership style was found to be significantly related to employee stress in the respondent sample. Specifically, managers untrained in techniques for promoting performance (goal achievement) and group processes (morale-boosting "people" skills) were found to have high levels of stress, as did their subordinates. First-line supervisors were the most at-risk group for stress-related health outcomes, behaviors and attitudes.

Research results indicate that mandatory instruction in Dr. Beaton's Social Skills Intervention and Humane Management Training in the Fire Service would improve productivity and morale and reduce stress levels. These are recommended for all supervisors and airport managers within Hawaii's airport firefighting hierarchy.

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1. Introduction

Firefighting in the United States (US) is an extremely dangerous occupation. It has one of the highest rates of on-the-job fatalities per 100,000 workers (36 in 1995 alone). The most current available statistics (IAFF, 1995) reveal that work hours lost by firefighters due to illness and injury were 4.5 times higher in 1994 than the average for workers in private industry.

Firefighting is also extremely stressful. Compared with other occupations, firefighters tend to have higher levels of mental and medical problems including Post-Traumatic Stress Disorder (PTSD) (Beaton, Murphy, & Corneil, 1996), gastrointestinal pain (Beaton, Murphy, & Pike, 1996), and sleep dysomnias (Beaton, Murphy, Pike & Jarrett, 1995). Also, previous research data revealed that problem drinking is prevalent among Hawaii's airport firefighters (Jacobs, 1995.)

Leadership style plays a key role in contributing to adverse health outcomes in subordinates. A modified NIOSH model of occupational stress and health (see Figure 1 in Appendix 1) specifically identifies "interpersonal communication & conflict resolution (social skills)" as job stressors (Hurrell, 1987).

The purpose of this research was to study the relationship between leadership style and employee health in Hawaii's airport firefighting personnel as measured by stress-related health outcomes. A particular focus was the relationship between the leadership style of first-line supervisors and the stress outcomes of the workers they supervise.

Leadership style was measured using a modified form of Misumi's Participative Management (PM) Leadership Scale as a basis. Employee stress indicators were assessed by five outcome variables--frequency of employee health problems, absenteeism, health care visits, health risk behaviors (such as smoking and alcohol use), and job dissatisfaction.

Research methods used were both historical and evaluative. Published documents were reviewed which documented firefighter stress and/or the relationships between leadership style and stress. Evaluative research was also conducted. A survey was developed and disseminated and data from this survey was analyzed. The survey was designed to measure the types of leadership styles as well as the effects of those leadership styles on firefighters and supervisors within Hawaii's airport firefighting units.

Specifically, this paper addresses the following research questions:

1. How do Hawaii's airport firefighters and managers rate their immediate supervisors on a number of management dimensions?

2. How do these firefighters' and managers' perceptions of their immediate supervisors, based on their ratings, correlate with their physiological, psychological and behavioral health?

3. Do survey results indicate, as does historical research, that first-line supervisors who lack both formal management training and experience in leading precipitate higher stress levels in both the subordinates they supervise and in themselves?

II. Background and Significance

Fire fighting in the US is a highly hazardous occupation in terms of percentage and severity of injuries sustained. The most current available statistics reveal that, nationwide, nearly 40 percent of all firefighters experienced a duty-related illness in 1994 and, in terms of severity, US firefighters lost 9,597 hours per 100 workers due to their injuries (IAFF, 1995).

In 1995, about 50 percent of line-of-duty injuries occurred at fire suppression scenes and the other 50 percent occurred during a variety of activities, including physical fitness (5.2 percent), training (4.9 percent), at the fire station (13.2 percent), en route to and returning from an incident scene (5.3 percent), and during emergency medical responses (11.7 percent). Over half of all line-of-duty injuries were musculoskeletal strains and sprains, and back injuries alone accounted for 56.3 percent of all injury disabilities while on the job (IAFF, 1996).

The purpose of this study was to determine if the psychological and behavioral influences exerted by their immediate supervisors were correlated with the severity and number of injuries, health care visits, health risk behaviors, health problems, and level of job dissatisfaction experienced by the firefighters and managers in Hawaii's airport system.

Historical research results suggest that the role of leadership in fire service supervisory personnel and its relationship to negative health outcomes in their subordinates is a key factor. A modified NIOSH model of occupational health and stress (see Figure 1 in Appendix 1) identifies "Interpersonal

Communication & Conflict Resolution (Social Skills)" as an important on-the-job stressor. The model shown in Figure 1 acknowledges the important roles of leadership and management factors in occupational health and safety in the fire service (Williams, 1996; Beaton, Murphy, Pike & Corneil, 1997).

In most fire departments, there is a strict paramilitary hierarchy of authority and command structure (Beaton, 1997). Fire department officers have to function according to standard operating procedures (SOP) and cope with such organizational and leadership issues as inevitable disagreements, power struggles, and conflicts with their superiors and subordinates. This conflict is often increased by the combination of paramilitary tradition and strong reliance on teamwork, especially at the scene of an emergency. Inherent in any multi-layered organization such as a fire department are communication problems, role conflicts, role ambiguity, and associated role strain (Goode, 1960; Hartsough, 1985.)

The style used by supervisors in managing their employees can have definite effects, both positive and negative, on specific outcomes such as employee morale and job satisfaction. However, there have been only a few studies that explored the relationship between leadership style and broader implications of its potential impact on employee psychological, physiological, and behavioral health.

For this research paper, Misumi's PM Leadership Theory and the Cognitive Stress Theory provided the basis for an approach to

the problem of leadership styles and their relationships to employee health. PM Leadership Theory suggests that employee health outcomes will be poorest in the case where supervisors are inexperienced, untrained, or both. That is, it is likely that such supervisors are less skilled with respect to establishing the high Performance (P) and Maintenance (M) variables that Misumi associates with positive employee outcomes. Since the least experienced supervisors are generally the first-line supervisors in the fire service, this research focuses on the latter and on the stress outcomes among their subordinates.

Cognitive stress theory defines stress as the relationship between the person and his or her environment that the person perceives as straining or exceeding personal resources and thus endangering well being (Lazarus and Folkman, 1984). This definition applied to the problem of leadership and employee health suggests that subordinates who work under the direct supervision of an inexperienced first-line supervisor (representing the "environment" in the definition above), are likely to perceive such supervision as being in conflict with their own needs and resources, and thus is appraised as a threat to their own "well being" (Tanabe, 1993).

Cognitive stress theory suggests that a cognitive process takes place and is the link between the workplace stressor (i.e., supervisor style) and the manifestation of stress outcomes (i.e., measures of employee health). That is, the day-to-day interactions with the supervisor can be perceived by an employee

as an important source of frustration and occupational stress. These interactions can thus have a negative psychological, physiological and/or behavioral impact on employee health.

It logically and morally follows that managers must ensure the optimum health possible for their employees. Undoubtedly, many factors, such as spill-over effects from non-work stressors, lie outside managers' control. However, managers can evaluate their leadership styles, acknowledge the impact these have on the employees, and ascertain ways to modify their behaviors so that they produce less stress and sickness and more productivity and wellness. Managers who take these steps can rest easy knowing they have done their best to influence their subordinates' health in a positive way.

The relationship of the subject matter of the Executive Fire Officer (EFO) course, "Executive Leadership," to this study on the relationship of leadership style to stress is best expressed by the following two quotes selected from required reading for the course (Hesselbein, 1996). The first, taken from the preface (Drucker, 1995), talks about the behavior of effective leaders: "They constantly asked, 'What are the organization's missions and goals? What constitutes performance and results in this organization?'" (p. xiii). The second statement is made by a professor and management expert (Handy, 1996), "The leader must have a love of people because otherwise, in a community of individuals, those who find individuals a pain and a nuisance may

be respected and feared, but they will not be willingly followed" (p. 8).

The ideas expressed above provided the impetus to seek a leadership theory that was measurable, incorporated mission goals, and addressed the question of what constitutes performance and what is meant by morale-boosting "people skills." The search ended with the discovery of Misumi's PM Leadership Theory, which is measurable and focuses on the goal- and morale-promoting attributes of good leaders.

III. Literature Review

What constitutes effective leadership within the structure of a fire department which has been described by some as hierarchical, inflexible, and paramilitaristic? In order to find a measurable way to answer this question, this writer reviewed a wide variety of management theories from written sources: textbooks, periodicals, journals, and a NIOSH grant application under review.

The literature revealed an abundance of information about a wide spectrum of management techniques. To briefly summarize a few of the well-known theories: In 1911, Scientific Management's creator Frederick W. Taylor proposed work methods designed to increase worker productivity. The ensuing controversy generated a congressional investigation to determine whether Taylor's model was a valid contribution to labor management relations or just another fancy name for work speed up. Taylor's principles gave

rise to dramatic productivity increases and his principles form an important phase in the evolution of management theory.

Total Quality Control (TQC) is the system developed by Japan to economically produce goods and services that meet the customers’ requirements and thus implement continuing improvement. TQC took the teachings of Deming, Juran, Feigenbaum, and others who brought the concept of quality to Japan, expanded upon them, and shaped them to conform to Japan’s unique culture. This management technique did an admirable job of putting quality into place both within the product and within the system to bring forth, sustain, and retire the product (Asaka, 1990).

In his theories on the roles of managers in the 1970s, Minzberg identified three managerial functions: the interpersonal, informational, and decisional roles. Within the interpersonal role, the manager’s favored means of communication is verbal. Within the informational role, managers seek information from peers, employees, and personal contacts about anything that may affect their job and responsibilities; they disseminate information internally (to their unit) and externally (to suppliers, the organization, etc.) Within decisional roles, managers base decision on information received and the decisions are then communicated to others. Minzberg believed it’s important for managers to design their own information systems, especially as organizations grow, because the need for coordination increases as growth leads to divisionalization.

Currently, library databases are overflowing with references to Total Quality Management (TQM) and Participative Management. TQM, based on theories of W. Edward Deming and others, is a style of management using continuous process improvement characterized by mission and customer focus; a systematic approach to operations; a vigorous development of human resources; long-term thinking; and a commitment to ensuring quality.

Participative Management Programs are formed around the idea that as managers become more involved with the workforce they empower employees to make their own decisions and thus decrease employee job dissatisfaction. Many companies are downsizing and creating flatter structures. As management realizes the need for more employee involvement and responsibility for their tasks, a change is occurring in the relationship between management and employees, resulting in the need for more manager participation and coaching in order to enable employees to be more productive. This in turn results in higher worker job satisfaction and lower employee grievances, which may be a contributing factor in the decline in union involvement over the past few years.

A study of the well-known management theories described above as well as numerous others, although educational, failed to reveal a measurable basis for determining a supervisor’s leadership style and how that leadership style affects stress levels and health indicators in subordinates. It wasn’t until Misumi’s Performance Maintenance (PM) Leadership Theory (Misumi, 1985) was reviewed that a fundamentally valid and measurable way to assess the

importance of leadership style variables was located. Therefore, Misumi's PM Leadership Scale was selected as one of the important measures of the survey battery administered to Hawaii's fire service personnel (see Section IV, Procedures.)

In his PM Leadership Theory, Misumi proposes that the P or Performance dimension is concerned with facilitating a workgroup's goal. In other words, P relates to a supervisor's ability to enhance workgroup productivity. The M or Maintenance dimension is concerned with promoting group processes or relationships. Thus, M has to do with a supervisor's ability to enhance the morale of workgroups.

Using the PM Scale, Misumi consistently found that employees who perceive and rate their supervisors as both high P and high M (high PM) tend to have higher levels of productivity, morale, job satisfaction, and lower levels of tension and anxiety. Thus, supervisors who are perceived as helping to get the job done (high P) and working to maintain good group processes (high M) have employees who are more productive, have higher morale, and are less anxious and tense (Misumi, 1988).

After the PM Leadership Theory was selected as a vehicle for structuring the survey, another search of the literature was conducted for studies dealing with firefighter stress, especially as it related to and was affected by leadership styles. This search unearthed several recent studies that dealt with stress factors/behaviors within fire departments, leadership styles

within fire departments, and the relationship of leadership style to firefighter stress (summarized below).

A study of US firefighters and paramedics documented high levels and frequent occurrences of self-reported psychological and other adverse health outcomes. Also described were frequent exposures to duty-related traumatic incidents and their stressful effects on this group (Beaton & Murphy, 1996; Beaton, Murphy & Corneil, 1996.)

As indicated earlier, most US fire departments operate by decree according to standard operating procedure (SOP). At fire and emergency medical incident scenes this incident-command style of management is definitely needed (Gist & Woodall, 1995.) However, most firefighters and paramedics spend about 90 percent of each 24-hour shift anticipating alarms and only two hours, on the average, at incident sites (Mitchell & Bray, 1990). The 22 hours spent at the firehouse and during routine training can cause administrative and co-worker tensions and conflicts (Beaton, 1997).

Although most work organizations experience some conflicts on interpersonal and organizational levels, the rigid administrative structures of many fire departments as well as the necessary heavy reliance on teamwork may serve to intensify the seriousness of such conflicts (Beaton, 1997). In fact, in a large scale survey of Washington state firefighters, of all firefighter/paramedic job stressors, the way management-labor conflict was perceived was the occupational stressor that was most strongly correlated with

reports of job dissatisfaction and poor work morale (Beaton & Murphy, 1993). This is important since two recent studies of blue collar plant employees have shown that psychological distress and job dissatisfaction predicted future disabling low back and other musculoskeletal pain problems (Leino & Magni, 1993; Bigos et al., 1991).

The type of relationship an employee has with his or her immediate supervisor is unique and significant (Fiedler & Chemers, 1974). A recent investigation of another crisis worker occupational group, emergency medical technicians (EMTs), identified supportive supervisory and work group behaviors as the most important predictors of work-related stress and psychological distress (Revicki & Gershon, 1996). These researchers concluded that improvements in supervisor behaviors, such as the adoption of a more open and supportive style, may protect EMTs from the negative effects of work-related stress associated with their daily working environment.

According to the modified NIOSH Systems Model of Occupational Safety and Health (Hurrell, 1987), severe psychological disorders as well as employee injury rates and absenteeism are influenced by exposures to organizational work variables. These variables include management styles and interpersonal relations and are likely to be moderated by perceived supervisor-employee support (see Figure 1 in Appendix 1.)

The findings of these earlier studies were the catalyst for the creation of a survey designed to ascertain the relationship of

leadership styles to firefighter stress behaviors among Hawaii's airport firefighters.

IV. Procedures

The procedures employed in this study were twofold--an assessment of previous (historical) research (described under Section III, Literature Review) and an evaluation of findings from surveys administered to Hawaii's airport firefighters in 1997.

The survey was designed to measure leadership style based on a modified version of Misumi's (1988) two-dimensional Performance Maintenance (PM) Leadership Scale. This particular scale was chosen because it yielded results that are reliable and relatively easy to comprehend.

The evaluative methodology used was to develop a 47-item questionnaire (see Appendix 2). The first step was to select significant stress behaviors to measure. Five categories--job dissatisfaction, frequency of employee health problems, absenteeism, health care visits, and health risk behaviors--were identified. These self-reported stress indicators were then correlated with measures of leadership style to determine if a statistically significant correlation exists.

The survey was field-tested on the 25 Hickam Fire Department Air Force 704 Civil Engineering Squadron (CES) Reserve Firefighters. This reserve unit, which is comprised of personnel from all the different fire departments within the state--City, State, and Federal--reported the survey questions to be clearly stated and easy to answer. Based on this initial response, it was

determined that the survey was ready for distribution to airport firefighting personnel.

Sample and Sampling Procedures

For the purposes of this study, the first-line supervisors within the Hawaii State Fire Department are the lieutenants, with a possible total n = 24 at the five airports surveyed--three each at Maui (Kahului), Kauai (Lihue), and the Big Island (both Hilo and Kona), and 12 at Honolulu International Airport (HIA) on Oahu. Three second-line supervisors, captains, are stationed at each airport except HIA, for a total n = 12; however, since there are only three assistant chiefs, all at HIA, they were grouped with captains to yield a total of 15 second-line supervisors. The third-line supervisors consist of the five fire chiefs. Thus, the total potential number of supervisory personnel n = 44, and total non-supervisory almost one hundred (n = 98.)

The surveys were distributed to the total population of 142 state firefighters. Only 90 were completed--26 by supervisors and 64 by firefighters. The surveys were then redistributed to the 18 supervisors--the 15 lieutenants, captains, and fire commanders, as well as the three fire chiefs--who did not complete them the first time, along with a request for completion and an explanation that more supervisory surveys were needed in order to have a significant basis of comparison between first-, second- and third-line supervisory personnel.

After the second request, all 18 supervisors cooperated, yielding a total of 108 completed surveys--all 44 supervisors as

well as 64 of the 98 nonsupervisory personnel. The sample of 108 completed surveys represents only 76 percent of the total population of 142 state firefighters. Statistically speaking, however, this sample is highly significant, for it yields a confidence level of slightly greater than 95 percent plus or minus 5 percent (Miller, 1991), which signifies that tabulated results are from 90 to 100 percent accurate for the entire population of Hawaii's airport firefighting personnel.

Survey Measures

The 20 questions in Section I of the survey measured leadership styles based on Misumi's PM leadership theory (Misumi, 1988; Smith, et al., 1989). Odd-numbered questions relate to the P (performance) leadership aspect and even-numbered questions to the M (group processes) aspect. In completing this section, employees rated the leadership styles of their primary supervisors.

Section II, designed to measure job dissatisfaction (a psychological index of workplace stress), consists of 5 questions adapted from the Gillespie-Numerof Burnout Inventory (GNBI) (Gillespie and Numerof, 1984). Section III, designed to measure health problems (a physiological index of stress) took 6 questions from the Psychosomatic Complaints Scale of Stress (PCSS) (Greller and Parsons, 1988). Two questions on frequency of absences from work and two on health care visits (behavioral stress indices) are also included in this section.

Section IV, created to measure health risk behaviors (another behavioral index of workplace stress) adapted questions taken from the State Department of Health's Health Risk Appraisal form. The questions on demographic and personal data in Section V were designed for the purpose of determining if age, years in the department, marital status, income, etc., had any relationship either to stress levels or perception of supervisory leadership styles.

Surveys were distributed anonymously to firefighters at HIA on the island of Oahu, as well as the airports at Lihue, Hilo, Kona, Kahului, Molokai, Lanai, and Kapalua on the neighbor islands. Survey results were tabulated by assigning number values to answers (see the legend in Appendix 3) and entering the data (more than 5,000 numbers) into a computer (Appendix 4.)

Results were interpreted by calculating percentages and averages of answers and comparing answers of firefighters, first-, second-, and third-line supervisors. As a further basis of comparison, answers for the overall organization and overall supervisors were tabulated.

All returned surveys were completed. Perhaps because they did not have to identify themselves by name (and consequently did not fear repercussions if they reported having problems with their supervisors), personnel answered all survey questions.

Limitations with the survey include the possibility that the self-report method (having personnel complete questionnaires) did not produce reliable and valid results. The self-report

methodology has produced inaccuracies in the past due to limitations including self-report biases, selective memory, and lack of awareness. For example, in survey results described earlier (Jacobs, 1995), firefighters reported their alcohol consumption as low when, according to Center for Disease Control (CDC) standards, it was actually quite high.

V. Results

Overall PM leadership style ratings (for total workers and supervisors) were determined by calculating the average, or mean, scores for P and M for the sample group who reported the highest PM scores. This sample group turned out to be the 12 captains and 3 assistant chiefs that comprise the second-line supervisors group. The latter's scores were averaged with the lowest PM scores (the firefighter sample.) This averaged score was used as the cut-off point for P versus p and M versus m.

For P and M, the cuts-off points are 80 percent and 81 percent, respectively. P and M mean scores were calculated for total firefighters, first-, second-, and third-line supervisors, total supervisors, and the overall organization (see Table 1).

Only one group, the second-line supervisors, gave their supervisors (the fire chiefs) P and M scores greater than these averages (88 percent and 93 percent, respectively). The other groups--firefighters, first- and third-line supervisors, overall supervisors and total organization--all had P and M scores lower than the break-off points of 80 and 81 percent. Thus, these groups' reported leadership style was labeled "pm" (meaning low p

and low m.) Two other leadership ratings, Pm and pM, are also possible; however, they did not occur in this study.

Low percentage scores reflect the least optimum condition. For example, the more job dissatisfaction a firefighter reports, the lower will be his percentage score for that category. In contrast, if the firefighter is completely satisfied with his job, his reported score would be 100 percent.

Overall, first-line supervisors (the 24 lieutenants) reported the lowest scores of any group in all five stress indexes. They reported the most job dissatisfaction (44.8 percent), health problems (48.4 percent), absenteeism (63 percent), health care visits (67 percent), and health risk behaviors (66 percent) of any of the six groups measured.

In contrast, the second-line supervisors reported the most job satisfaction (66 percent), the least health problems (70 percent), the least absenteeism (70 percent), the least health care visits (70 percent) and the least health risk behaviors (74 percent). For a detailed breakdown of raw scores and percentages of the five stress-producing categories, as well as perceived leadership styles by the four groups surveyed (firefighters, first-, second-, and third-line supervisors), see Table 1.

In PM Leadership Theory, P relates to a supervisor’s ability to enhance workgroup productivity and M to promote group relationships. PM-type leaders (i.e., high P, high M) have been shown to be more effective in cultivating worker job productivity and morale.

As shown in Table 1, firefighters rated their first-line supervisors as pm-type, a leadership style that is counterproductive in promoting worker morale and productivity. For the firefighters, since their average P scores (71.7 percent) were over 16 percent below the highest scores (88 percent for the second-line supervisors) and their average M scores (69.6 percent) were over 23 percent below the highest scores (93 percent for the second-line supervisors), the leadership style of the first-line supervisors (lieutenants) was determined to be pm, as rated by the firefighters.

The p and m scores for total supervisors were only slightly higher than the p and m overall scores for the organization. Total supervisory p-ratings were 74.3 percent and m-ratings 71.6 percent, compared to the overall organizational m-scores of 72.4 percent and p-scores of 70 percent.

An unexpected result was that the five fire chiefs gave their own supervisors, the airport managers, a low p-rating (71.7 percent) and a low m-rating (76 percent.) This indicates that, while the second-line supervisors believe that the fire chiefs display high productive and people skills, the fire chiefs do not feel supported by their own bosses or included in their policy-making processes.

Raw scores for P and M and the five stress variables--job dissatisfaction, health problems, absenteeism, health care visits, and health risk behaviors--as well as percentage of optimum

responses and PM styles for each of the six groups are displayed in Table 1 below.

Table 1

PM Leadership Styles and Stress Outcomes

Averages for Raw Score Data, Percentages of Optimum Answers, and PM style ratings)

CATEGORIES

Groups	P-Rating of Supervisors	M-Rating of Supervisors	Job Dissatisfaction	Health problems	Absenteeism	Health Care Visits	Health Risk Behaviors
Total Workers (64)	3.3 72.7% p-style	3.48 69.6% m-style	2.14 57.2%	1.95 61%	1.75 65%	1.6 68%	1.6 68%
1st-line Supervisors (24)	3.43 74.6% p-style	3.49 69.8% m-style	2.76 44.8%	2.58 48.4%	1.85 63%	1.65 67%	1.7 66%
2nd-line Supervisors (15)	4.1 88% P-style	4.7 93% M-style	1.7 66%	1.5 70%	1.5 70%	1.5 70%	1.3 74%
3rd-line Supervisors (5)	3.3 71.7% p-style	3.8 76% m-style	2.12 57.6%	1.9 62%	1.6 62%	1.6 68%	1.2 76%
Total Supervisors (44)	3.42 74.3% p-style	3.58 71.6% m-style	2.34 53.2%	2.1 58%	1.8 64%	1.6 68%	1.7 68%
TOTAL ORGANIZATION (108)	3.33 72.4% p-style	3.51 70% m-style	2.3 54%	1.68 66.4%	1.8 64%	1.6 68%	1.6 68%

Overall, leadership style in the respondent sample was found to be significantly related to employee stress. In and of itself, perceiving one's own supervisor as a PM-type leader seems to be associated with lower stress levels. The second-line supervisors, who rated the fire chiefs as PM-type leaders, reported significantly lower job dissatisfaction (as well as fewer health

problems, absenteeism and health care visits) than any of the other groups. The fire chiefs followed next in line behind the second-line supervisors in reported low stress levels for the five indicators. The one exception was that the fire chiefs had the lowest self-reported health risk behaviors of any group surveyed.

Leadership style that was determined to be pm-type was related to higher stress levels for each of the five stress indicators. Witness the case of the unfortunate first-line supervisors, the lieutenants, who are perceived by the firefighters as failing to promote P-leadership (group productivity and goal achievement) or M-leadership (group stability and supportive relationships). These first-time supervisors also perceive their own supervisors, the captains or assistant chiefs, as non-supportive. It is no wonder that lieutenants have the highest self-reported levels of job dissatisfaction, health problems, absenteeism, health care visits, and high risk behaviors of any of the four groups surveyed.

Within Hawaii's airport firefighting units, the first-line supervisors were rated as pm-type. In contrast, the second-line managers rated their supervisors (the fire chiefs) as PM-type, a more effective leadership style in connection with promoting job morale and productivity. The fire chiefs rated their own supervisors, the airport managers, as pm-type supervisors, perhaps reflecting dissatisfaction with a decentralized system that is perceived by many of Hawaii's airport firefighting personnel as

aloof and indifferent to their organizational goals and group processes.

In summary, survey results support the original hypothesis that first-line supervisors within the fire department, lacking the benefit of both formal management training and experience in leading, tend to be associated with higher stress levels in both the subordinates they supervise and in themselves. Indeed, results suggest that first-line supervisors have more adverse health outcomes than the men they supervise, who at least have the benefit of peer-group support.

At all supervisory levels within the fire department, however, management’s lack of productive and morale-boosting leadership skills negatively affect stress levels in subordinates. Witness the case of Hawaii’s fire chiefs who, although perceived as supportive leaders themselves, must grapple with the problems of working for supervisors who represent a decentralized system, and whose philosophy and vision may be miles apart from their own.

With respect to demographic data, none of these variables--age, years with the department, yearly income, time spent under current supervisor, previous supervisory experience, and education levels--showed a definitive correlation with stress outcomes. However, unexpected results occurred when marital status was compared to health risk behaviors (drinking, smoking, and/or taking mind-altering prescription drugs.)

Raw scores were computed for the 108 personnel surveyed, 75 of which are married, 2 separated, 6 single (never married), 1

widowed, 6 remarried, and 18 divorced. The raw score representing 100 percent (indicating the person who never smokes, drinks, or takes mind-altering prescription drugs) is 3. The higher the number, the greater the health-risk behavior (the highest possible score for the person who drinks, smokes and takes drugs every day would be 15).

Understandably, the highest-risk group is the two separated personnel (average score of 5.5). In contrast with results of other studies, the next highest-risk group is the married men, averaging 4.85. The divorcees are next (4.78), followed by single men (4.17), remarried personnel (3.83) and the one widower (3).

Not even the highest scores reported above necessarily represent high-risk behaviors. Even a score of 5.5 can merely indicate someone who smokes every day and likes to have a beer two or three nights a week. However, these self-reported scores cast a doubt on the validity of survey answers, since results from a previous research paper (Jacobs, 1995) showed that Hawaii’s airport firefighters are, at least by CDC standards, heavy drinkers. Such behaviors are difficult to measure with paper and pencil tests.

Dr. Randal Beaton (e-mail correspondence, March 6, 1998) reviewed our survey results for statistical verification and applied further statistical calculations to the data. He discovered several statistically significant correlations with p values less than .05 (see Table 2). Rather than simply looking at dichotomous variables (P versus p), Dr. Beaton used the

respondent's scores across their entire range to come up with Maintenance leadership scores (M) and Performance scores (P). He also calculated a total of P and M scores (labeled P_M) and correlated this total leadership score with the other variables. Dr. Beaton calculated a total job dissatisfaction (JOBD) score by adding data from questions 21-25, a total health problems (HPRO) score by adding 26-31, an absenteeism (ABSE) score by tallying 32-34, and a health risk behaviors (HRB) score by adding 36-38. Health visits (HVIS) were based on replies to item #35 and job title/rank (RANK) was based on replies to item #40.

There was a strong correlation between P and M leadership scores (ratio (r) = .83). Also both P and M leadership scores correlated negatively with job dissatisfaction (r = .31 and .42, respectively; with p values of less than or = .001). In addition, P leadership scores correlated significantly with job title (and rank of their supervisor) and significantly with r = .21 (P = .027), but M leadership scores and job title correlations were not quite statistically significant (r = .18; p = .058). The survey respondents' M leadership scores correlated significantly with both job dissatisfaction and job title.

Other intriguing results discovered by Dr. Beaton include the positive correlation of job dissatisfaction scores with both health problems and health visits (r = .34 and r = .24, respectively.) Also absenteeism scores were significantly associated with health problem scores (r= .30; p = .002) and health visits (r = .42; p less than .001). Also, health visits

and health problems scores were correlated significantly (r = .20; p = .04).

Dr. Beaton’s findings support the contention that first-line supervisors, who are more likely to identify their supervisor’s leadership styles as more pm, are at risk. In fact, across ranks, those who identified their leader’s style as more p than P and more m than M tended to report significantly more job dissatisfaction. Furthermore, those fire service personnel who reported more job dissatisfaction also tended to report more health problems and more health visits. Health risk behavior scores were also associated with higher health visits scores.

TABLE 2

CORRELATION COEFFICIENTS

	M	P	P_M	ABSE	HPRO	HVIS	HRB	JOBD	RANK
M	1.0000 (108) P= _	.8344 (108) P=.000	.9637 (108) P=.000	.0717 (108) P=.461	-.1955 (108) P=.043	-.1031 (108) P=.289	-.0746 (108) P=.443	-.4161 (108) P=.000	.1830 (108) P=.058
P	.8344 (108) P=.000	1.0000 (108) P= _	.9512 (108) P=.000	.1292 (108) P=.183	-.1191 (108) P=.220	-.0207 (108) P=.832	-.0743 (108) P=.445	-.3136 (108) P=.001	.2133 (108) P=.027
P_M	.9637 (108) P=.000	.9512 (108) P=.000	1.0000 (108) P=_	.1027 (108) P=.290	-.1671 (108) P=.084	-.0677 (108) P=.486	-.0778 (108) P=.424	-.3848 (108) P=.000	.2057 (108) P=.033
ABSE	.0717 (108) P=.461	.1292 (108) P=.183	.1027 (108) P=.290	1.0000 (108) P=_	.2972 (108) P=.002	.4205 (108) P=.000	.1795 (108) P=.063	.0643 (108) P=.509	-.0608 (108) P=.532
HPRO	-.1955 (108) P=.043	-.1191 (108) P=.220	-.1671 (108) P=.084	.2972 (108) P=.002	1.0000 (108) P=_	.1981 (108) P=.040	.2719 (108) P=.004	.3358 (108) P=.000	.0011 (108) P=.991
HVIS	-.1031 (108) P=.289	-.0207 (108) P=.832	-.0677 (108) P=.486	.4205 (108) P=.000	.1981 (108) P=.040	1.0000 (108) P=_	.2978 (108) P=.002	.2357 (108) P=.014	-.0200 (108) P=.837
HRB	-.0746 (108) P=.443	-.0743 (108) P=.445	-.0778 (108) P=.424	.1795 (108) P=.063	.2719 (108) P=.004	.2978 (108) P=.002	1.0000 (108) P=_	.1481 (108) P=.126	.0520 (108) P=.593
JOBD	_.4161	-.3136	-.3848	.0643	.3358	.2357	.1481	1.0000	.1350

	(108) P=.000	(108) P=.001	(108) P=.000	(108) P=.509	(108) P=.000	(108) P=.014	(108) P=.126	(108) P=_	(108) P=.164
RANK	.1830	.2133	.2057	-.0608	.0011	-.0200	-.0520	.1350	1.0000
	(108) P=.058	(108) P=.027	(108) P=.033	(108) P=.532	(108) P=.991	(108) P=.837	(108) P=.593	(108) P=.164	(108) P=_

NOTE: “ _ ” is printed if a coefficient cannot be computed

P = Performance, M = Maintenance, ABSE = Absences, HPRO = Health Problems, HVIS = Health Visits, HRB = Health Risk Behaviors, JOBD = Job Dissatisfaction

VI. Discussion

The survey results confirmed and extended prior research findings, and positively correlated with historical research. As described in Section III, Literature Review, several prior investigative studies show a significant correlation between leadership style and employee stress levels--the more inexperienced the supervisor, the greater the stress. Both historical research and the findings of the present evaluative study indicated that first-line supervisors were the most stressed and, at the same time, the most stress-inducing group.

Misumi’s research found leadership style to be related to employee productivity and morale. His theory links P-leadership behavior with group performance and goal achievement and M-behavior with promoting group cohesiveness, stability, and survival. According to Misumi, PM-type leadership style is related to lower stress and pm-type to higher stress in employees (Tanabe, 1993.) Current survey results bore out his theories in that PM-supervisory styles in firefighter supervisors were

associated with lower ratios of self-reported stress behaviors in subordinates.

Firefighter personnel test for supervisory positions after attaining a minimum number of years of service but receive little, if any, formal leadership or management education and/or training before or after promotion. This fact undoubtedly contributes to a perception by firefighters that their first-line supervisors lack management skill. The first-line supervisors cannot help but feel unsupported in this situation. Placing someone with no management training into a management position is like throwing someone who can’t swim into the water and saying, “Sink or swim.” Some sink and some swim but all are stressed.

Firefighters promoted into first-line supervisory positions suddenly face a situation where former fellow-firefighters and peers are now their subordinates. Undoubtedly these new supervisors face a certain amount of role conflict between their loyalty to and membership in that group and the new expectations placed on them by their new supervisors, the second-line supervisors.

These new supervisors need help in making the transition into the supervisory ranks. The appropriate type of education would be a valuable tool for instilling skills and knowledge, facilitating their expertise and, thus, improving their self confidence.

Research findings (Beaton, 1998) indicate that fire officers with formal management and stress reduction training are more

effective leaders as reflected in the supervisory ratings by their subordinates. This in turn may result in improvements in detrimental health conditions and increased safety outcomes in both supervisors and line personnel.

Based on these preliminary findings it is hypothesized that two types of leadership education are needed--education in leader-match principles and social skills training, and stress reduction techniques tailored to fire service officers (Beaton, 1997). Training that included leader match and stress reduction techniques for Washington State National Guard officers significantly reduced the reported adverse health symptoms in their subordinate National Guard recruits (Link, 1990).

One long-term outcome study of mining personnel documented that leader match training alone reduced employee injury rates by 50 percent and these reduced injury rates lasted for at least five years (Fiedler, Bell, Chemers, & Patrick, 1984). Two other components of leadership intervention that improved leadership skills in Canadian Government workers--team leader skills and social skills training--may also be of benefit in fire officers management training (Corneil, 1991; 1994; 1996).

Another study discovered that, even in a low-stress workplace, pm-leadership style produced more employee stress than did PM-type leadership (Tanabe, 1993.) This research suggests that leadership style is a much more important factor in highly productive, stable, healthy, high-morale workplaces than is generally recognized. Indeed, Tanabe (1993) suggested that

leadership style among lower-level supervisors may be the key factor in achieving organizational success.

Organizational implications of both historical studies and survey results for Hawaii's airport firefighters are clear. We need to require leadership training as a prerequisite to promotion into the supervisory ranks. This training should be required of all supervisors, along with continued in-service training at set intervals, to ensure that our supervisors are practicing leadership skills that will enhance performance and the achievement of goals, improve morale, and decrease stress outcomes of their subordinates.

VII. Recommendations

As revealed by the present survey results and findings from prior research, education in ways to improve leadership skills and to reduce stress levels is needed for all the supervisors (including the airport managers) of Hawaii's airport firefighting units. Training is especially important for first-line supervisors, the lieutenants.

An important rationale for offering this type of education to firefighting supervisors is that officers, and especially first-line supervisors (lieutenants) appear to be at increased risk (see Figure 2 in Appendix 1) for many of the adverse health consequences of fire service job-related stress (Beaton, Murphy & Corneil, 1996; Beaton, 1997). Two interrelated goals of the leadership training proposed herein are to reduce the stress and improve the management skills of the fire service officers.

The conclusions based on studies of the Washington State fire departments (Beaton, 1997) hold true for other fire departments (including Hawaii airport firefighting units) as well. In most, if not all, fire departments, firefighter personnel test for supervisory positions after attaining a certain, minimum number of years of service. Unfortunately, they receive little, if any, formal leadership or management education or training either before or after a promotion.

Thus, it is suggested that fire officers who receive formal management and stress reduction training will be more effective leaders (in Misumi's terms, they will become PM-type leaders.) Although this training could be accomplished in a variety of ways, only one training program, consolidated by Dr. Randal Beaton, was located that is both cost effective and specifically designed to meet the unique needs of firefighting personnel.

According to Beaton (1997), one important component of a training program should include "emotional first aid skills," which could be taught to fire service officers through a 5-hour Social Skills Intervention Training Class for Fire Service Officers along with a 1-hour Humane Management in the Fire Service video (Fiedler, 1981).

The 5-hour module includes such areas as dealing with people under duress, crisis intervention techniques, and social support interventions. The 1-hour video is sponsored by the Federal Emergency Management Agency (FEMA) and uses actual fire service

personnel to enhance it's credibility (see Appendix 5 for a complete breakdown of course content.)

Tentative costs for the program, which include an initial assessment, fees for trained professionals in the field to instruct Hawaii's firefighters on five different islands, and several 5-hour modules and 1-hour videos, are estimated at $25,000. Not only is this 6-hour educational program cost effective, it's brevity would allow for easy implementation into the department's training schedule.

Two possible methods and sources for program implementation are recommended. First, the Airports Division's Firefighting Staff Officer should develop a request for proposal based on the course curriculum to identify qualified applicants for the implementation and teaching of the course. If qualified candidates cannot be identified, a sole source request would be required for contracting the services of the program authors.

A second option is that the University of Hawaii's Fire and Environmental Services Coordinator approve the program curriculum and determine the qualifications necessary for the implementation and instruction. Subsequently, the Department of Transportation should contract out the services from the university system. This would ensure effective communication for and local knowledge of Hawaii's people; thus, cultural diversity will be adequately addressed.

It is recommended that proposal number one be explored first. If favorable results cannot be achieved via this method, then

proposal number two should be considered. The latter proposal would be dependent on the university staff's ability to identify instructors with the necessary background knowledge and experience in the fire service field combined with the appropriate academic expertise.

Effective management requires programs that are able to remedy all types of stresses brought about by poor leadership skills. In order to promote the best possible psychological, physiological, and behavioral health of Hawaii's airport firefighting personnel, it is imperative that fire department leaders improve their productivity and "people" leadership skills and reduce their own stress levels as well as the stress levels of those they supervise.

The Leader Match, Stress Reduction, Social Skills Intervention Training for Fire Service Officers and the Humane Management in the Fire Service video represent an important step toward these goals. This study has identified the importance of educating supervisors through a leadership and management training program as soon as feasible. The health, morale, and productivity of Hawaii's airport firefighting personnel may well depend on it.

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